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AUTHOR Webb, Ruth C.; And Others
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AESTRACT

Discussed are the theoretical background and evaluation procedures of the Glenwood Awareness, Manipulation, and Posture Index Number One, an instrument for measuring the sensory-motor bases of behavior in the profoundly retarded. The authors maintain that, by using the processes of recognition, interaction, and mobility as criteria for the developmental levels of awareness, manipulation, and posture, it becomes possible to assess reception of sensory stimuli and development of recognition processes separately from the assessment of fine and gross motor skills and mobility skills. Described are items of the Awareness Scale which elicit defensive reactions to aversive stimuli, entice the child to draw closer to pleasurable sensations, and evaluate the child's ability to combine memory of past events with the stimulus of the moment. The Manipulation Scale is designed to appraise a child's inclination to handle objects spontaneously, to respond to gestured and spoken commands, and to communicate needs and desires through language (with or without words). The Posture Scale is said to evaluate ability to maintain a secure position in space in both stationary and movement states. It is noted that the test is without statistical validation, but that it has been helpful in identifying children who are alert but lack the motor capacity to express that alertness. (GW)

EVALUATING THE SENSORY-MOTOR BASES OF BEHAVIOR IN THE PROFOUNDLY RETARDED

Ruth C. Webb, Ph.D.
and
Staff of Department of Developmental Therapy
Glenwood State Hospital-School
Glenwood, Iowa

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Introduction

In 1961, Heber defined adaptive behavior as the degree of effectiveness with which the individual copes with physical and social demands of his environment. Independent functioning and the ability to meet "culturally-imposed demands of personal and social responsibility" were described as major facets (Heber 1961, p. 61). While acknowledging that adaptive behavior as a measure of present functioning was related to intellectual capacity as measured by traditional intelligence tests, Heber supplied a new theoretical dimension with which to describe behavioral deficits in the mentally retarded. This dimension included a wide range of behaviors --intellectual, affective, motivational, socail, and motor. All of them contribute to an individual's level of physical functioning and social interaction. The factors, most basic to adaptive behavior, were deemed to be intellectual, personal-social and sensory-motor in nature. The latter two were judged to be crucial operational concomitants of mental retardation.

Four levels of retardation in terms of adaptive behavior were described; the further the level deviated from the mean, the more obvious became the defects in personal-social relationships and sensory-functioning. . . . Individuals exhibiting "profound negative deviation from the norms of adaptive behavior" showed only minimal sensory-motor response and were "entirely incapable of self-maintenance." (Heber 1961, p. 63).

Heber's description of adaptive behavior in the mentally retarded has stimulated many efforts for its more exact definition and measurement. Authors have disagreed as to the nature and number of the components of adaptive behavior, the degree of its relationship with "measured intelligence," and its dependence on environmental stimulation (Leland 1966). The Cain-Levine Social Competency Scale (1963), the Adaptive Behavior Scale (1969), and the Balthazar Adaptive Scales (1971) represent attempts to measure small and detailed steps towards independent functioning as a socially responsible person. These instruments have contributed greatly to the diagnosis and training of children at the lower end of scale in regard to adaptive behavior.

However, there is a group of grossly handicapped individuals who have not been greatly helped by the concept of adaptive behavior. Their behavior is characterized by the total inability to adapt to their physical and social environment. Although these profoundly retarded individuals represent only two and a half percent of the general population (Heber 1961), they reputedly constitute fifty percent of retarded persons in the United States (Robinson and Robinson 1965, p. 50). A recent survey of the residents at Glenwood State Hospital-School shows that sixty-nine percent of all population are classified as having "severe and profound negative deviation from the mean." The behavioral syndromes displayed by this group seemed to fall into three clusters. These are clinically described as: 1) gross underdevelopment in awareness; 2) lack of ability to interact with their physical and social environment; and 3) failure to attain an upright and mobile

position in space. The following paragraph summarizes the phenomenological effects of these syndromes.

Symtomalogy

Level of awareness: Some of these children may be so inert that they give no apparent response to sensory stimuli. Other brain-injured youngsters seem to withdraw actively into autistic shells. Both situations seriously disrupt the normal development of recognizing pleasant and unpleasant stimuli, remembering past exposures to them and exercising discrimination in anticipating or avoiding future contacts with them. Without the ability to respond and respond selectively, profoundly retarded individuals cannot act with much preconceived, or even immediate, intentionality. With disturbance in arousal level is usually found gross impairment in ability to make gross motor responses. Inert children scarcely move and other youngsters who are hyperactive move constantly. Both conditions interfere with basic motor reflexes and the later integration of motor effectors with multiple sensory receptors (tactility, kinesthesia, audition, vision, etc.). Lacking the emergence of normal patterns of head, trunk and limbs, the profoundly retarded child does not possess the gross movements which are used by the normal youngster in making progressively more adequate motor adjustments to the sensory stimuli he receives.

Manipulation of the physical and social environment: Impaired awareness and motor development make it extremely difficult for the totally disabled child to alter his physical and social environments in order to gain satisfaction of first physical, and then emotional needs. The quality of arousal reactions and movement patterns, especially the coordination of fine muscle groups, as hands and eyes, affects the quality of the child's efforts to reach, grasp, hold, manipulate, i.e. to accept or reject objects and people in his surroundings. Without the integration of sensory-motor units through repetition of these acts, the impaired child does not develop the capacity to change his surrounds. Lack of manipulation of physical objects is coupled with inability to interact with people. In such cases, cooperation and competition cannot arise from social experience and self-identity cannot grow from satisfactions and frustrations of basic needs through interactions with other humans.

Upright and mobile posture: The grossly retarded child has great difficulty in achieving the upright position against gravity quickly achieved by the normal youngster. Some profoundly retarded children do learn to stand and walk. Others gain sitting, creeping, and crawling postures. Far too many never attain head and trunk control and lie prone or supine so many years that muscles tighten and contort trunks and limbs into unusual shapes. Because these children do not have stable and upright positions from which movements through space can originate and at which movements can terminate, knowledge of directionality and laterality cannot be learned through motor experience. The person who lacks secure sitting and walking postures has diffficulty in establishing stable physical and perceptual relationships with the environment. He is not free to explore boundaries marking the physical space around him and so cannot build from actual experience the psychological space from which the body image and self-concept arise.

Theoretical Design

These syndromes in their extreme expression severely limit the development of adaptive behavior beyond the physiological level. Accurate evaluation of behavior and prediction of learning capacities in severely handicapped youngsters is difficult by aid of the previously described instruments. Existing rating scales based on developmental norms for non-impaired infants cannot predict learning capacities in children who cannot direct their movements. They also cannot give much information about children who move without apparent purpose. When we started a sensory-motor training program for multiply handicapped and profoundly retarded children, we looked for an instrument which would evaluate the integration of sensory motor patterns, basic to adaptive behavior. Because we found no instrument that could answer our needs, we (it was a department-wide effort!) designed and developed the Glenwood Awareness, Manipulation, and Posture Index Number One.

In constructing this measure of sensory motor integration, three empirical questions had to be answered: 1) what behavior do we want to measure? 2) how do we preceed to measure this behavior? 3) how do we summarize the results of measurement?

"The what question" involved a theoretical framework. Three dimensions of behavior were developed from the three syndromes. The areas of awareness, manipulation and posture interact in the development of the normal child. They are admittedly global dimensions but each one contributes a description of physical and psychological aspects of pre-adaptive behavior.

For the purpose of the Glenwood AMP #1, processes basic to awareness are the development of selective attention, the recognition of familiar persons and objects and differentiation of body parts. Recognition processes theoretically develop from the gradual evolution of meaning from sensory stimuli. Reception and integration of sensory stimuli depends on intact sensory receptors (tactile, visual, auditory, and kinesthetic). The normal infant quickly combines these individual sense receptors into perceptual systems, i.e., looking-listening, touching, tasting-smelling, and basic orientation (J. J. Gibson 1966). These perceptual modes imply direction of focus. Fantz (1964) has established evidence of fixation to light at birth. At first aroused by extreme stimuli, the attention process gradually lengthens and is evoked by novel stimuli (providing that it is not too unusual). Piaget (1954) established that the eight month old infant searches for a displaced object; this object permanence is accompanied by person permanence and reflects the growing realization that objects and people do not cease to exist when they disappear. Self differentiation also progresses with object differentiation (Dunsing 1965). Fantz and Nevis (1967) supply evidence that infants recognize familiar faces any where from one to six months. Piaget (1954) says that object naming is the first step of categorization and it begins at the age of one year.

These brief citations from the literature supply experimental evidence and theorectical rationales for the inclusion of items testing avoidance reactions to extreme stimuli, approach reactions to pleasant stimuli, and items requiring recognition of objects, familiar people, and body parts and names (indicating self differentiation). These items diagram the development of recognition skills from the basic arousal and attention mechanisms.

Analysis of factors in the manipulation dimension shows the development of interaction skills from manual dexterity and fine motor coordination. The normal

child quickly mobilizes his increasing hand and finger control to show his recognition of familiar people and objects. The ability to explore and use objects is implicit as well as the ability to recognize causal and spatial relationships. Lichtenberg and Norton (1971) emphasize that action binds the child to people and things in a mutually pleasurable relationship. Interaction skills imply reciprocal relationship with people. When the child relates to others, he also relates to himself (Lichtenberg and Norton 1971); success in manipulating objects brings gradual awareness of ability to control of the environment. Coordination of hand and eye and hand and hand promotes control of self (or parts of self) with control of objects. At the same time the child learns to respond to social signals, i.e., gestures and words. Piaget (1954) says that imitation is the prelude to mental images; repetition of motor patterns brings memory into play and begins to make deposits in the memory bank. All these factors lay the groundwork for self direction. With the ability to relate to people and to use objects, the child establishes the information reservoir necessary for intentional interaction with the physical and social environment (Hunt 1969).

The theoretical rationale supporting the posture dimension comes primarily from Kephart (1960) and Dunsing (1965). Factors in static and dynamic posture lead to mobility skills and include both physical and psychological factors. Not only to move independently but he also has to construct a body scheme (Bean 1926) which will serve as a point of origin for differentiating time and space (Dunsing 1965). Kinesthetic input is essential in the process of relating the feeling of ever changing postures to previous positions. Through muscular feedback the child learns literally where he is in space and the relationship of his vertical and horizontal planes to gravity. Limb movements are differentiated from primitive reflexes and then integrated into rhythmic patterns from which balancing mechanisms arise. Body awareness arises from "synchony of movements" integrated for a purpose. The kinesthetic feedback from these movements provide a feeling of "nowness" (Dunsing 1965). This present kinesthetic feedback is affected by past k-inputs and in turn affects the k-inputs of the future. In this way a continual awareness of movement lays the groundwork for conceptualizing the duration of time. Movement away and toward objects develops the sense of space; the child learns to recognize space through arranging the objects in it.

In addition to the development of time and space concepts through mobility, physical and psychological independence is greatly influenced by secure position and mobility. It is difficult to reach distant objects without mobility, the child cannot act as a completely self directing individual without normally functioning feet to take him where he wants to go.

Thus the Glenwood AMP evaluates pre-adaptive behavior by appraising the development of recognition, interaction and mobility skills. In using these three sets of processes as criteria for the developmental levels of awareness, manipulation and posture, it becomes possible to separate reception of sensory stimuli and development of recognition processes from the fine and gross motor skills involved in interacting with objects and people as well as mobility.

Evaluation Procedures

In order to answer the second question as to the exact procedures used in measuring the development of awareness, manipulation and posture, a section by section analysis of the AMP now follows.

The basis for all learning is the sensory systems. We must first know what sensory receptors are functioning in the child and how they are receiving imput from the environment. The Awareness Scale is comprised of three sections. Section A, Avoidance, elecits defensive reactions to uncomfortable stimuli. All of the items under this section present aversive stimuli. In normal development, such reactions generally are seen before the child responds to positive stimuli. Items under Section B, Approach, are designed to entice the child to draw closer to pleasurable sensations.. In Section C, Integrating Memory with Present Stimuli, the child is evaluated for his ability to combine memory of past events with the stimulus of the moment. Awareness of people and common objects as well as rudimentary comprehension of communication symbols and body image is evaluated. The development of object permanence and spatial relationships is also included. The first two parts of the Awareness section checks the reponse of the individual senses to paintul stimuli and then to soothing or novel stimuli.

The development of recognition processes not only depends upon intact sensory receptors (tactility, vision, audition and kinesthesia) but also upon the integration of the sensory receptors with one another and with the "mediating processes of attention." Recognition processes have to be measured not only in terms of withdrawal from pain or over-stimulation of individual senses but also in terms of approach reaction to stimuli commonly known to be pleasurable. Nine items evaluate response to over-stimulation, i.e., pain (restriction of body, sharp tapping, extreme temperatures, loud noises, strong light, unpleasant odors and tastes, and loss of position). These same sensory systems are tested in the Approach section. Seven items elicit smiling or reaching responses to cuddling, soothing sounds, novel movements and pleasant odors and tastes.

Ability to focus, to follow a moving object, and to shift the focus from one object to another are developmental steps which bridge the gap from the initial arousal response to the establishment of memory implicit in the recognition of people and objects in the surrounding environment. These processes are evaluated by the nine items in part C. These intermediate steps in the acquisition of recognition processes cannot be evaluated without the use of objects of recognition--namely, people and implements in the environment. Concomitant with the differentiation of people and objects comes the identification of the self. In the development of the memory processes, recognition skills evolve gradually in response to people, objects and the self. Recognition of familiar persons is indicated when a child smiles at their appearance or responds to their names. At the same time the child should relate to familiar people through their actions. He learns to respond to their gestures in expectation of something happening (i.e., being picked up when arms are outstretched). The game of "peek-a-boo" affords him pleasure and it is a step toward developing the concept that a person exists even though he is not in sight. This principle is also tested in response to object permanence when a block disappears from the table. The child must hear and comprehend in order to recognize the spoken name of objects, his body parts or his own name. There are nine items which test the integration of memory with present stimuli. Successful response to all of them indicates that the child has integrated sensory impressions into meaningful impressions of his immediate surrounds. He now has the recognition skills necessary to establish the goal-seeking so essential to adaptive behavior. These skills include recognition of pain and pleasure stimuli, the names of familiar objects, other people, and his own self and the early beginnings of body and verbal language. Successful response to the twenty-five items on the Awareness Scale indicates integration of sensory with memory processes on the one year level of normal development.

The Manipulation Scale contains three sections. Items in Section A, Responses to Objects, appraise the child's inclination to handle objects spontaneously. Items in Section B, Responses to Commands, evaluate the child's response to gesture and spoken commands. Items in Section C, Expression of Intentionality, elicit communication of needs and desires through language with or without words. In appraising these three areas, this scale evaluates fine motor movements which are performed with intentionality. This means that the child must actively perform each item because he desires to do so or is willing to cooperate at the time of the evaluation. Manipulation of objects develops with increasing manual dexterity and improving coordination between hands and eyes, hand and hand, hands and feet. These motor abilities blend with memory and discrimination to enable the child to develop increasing control of his environment.

Twenty-five items on the Manipulation Scale evaluate the child's capacity to interact with the objects and people in his environment through manual dexterity. The Manipulation Scale also gives the child a chance to show his knowledge of spatial and causal realtionships through his handling of objects. The first six items invite the child to respond spontaneously to toys of various sizes. These items encourage him to reach, grasp, hold, transfer, squeeze, and to use a pincher grasp to pick up a bead. These items give opportunity to evaluate hand preference, finger dexterity and degree of strength as well as hand-eye and hand-hand coordination. As with all the items in the Manipulation Scale integration of fine motor movements with the sensory receptors in the performance of intentional acts is evaluated.

Section B evaluates responses to gesture and verbal commands. The child shows his ability to imitate the evaluator by manipulating sand and clay, and pounding with a block or dropping it in a can. Development of the figure-ground relationship is evaluated by the child pulling a ring on a stake or poking a finger into a small hole. Readiness to obey gesture commands is shown by response to outstretched arms or to the game of "pat-a-cake." Understanding of and willingness to comply with verbal commands is necessary in the five items which indicate that the child sees causal and spatial relationships. He is also willing to work to achieve goals when he pulls a string to get a toy, removes a box which covers candy, and stacks one block upon another. Scribbling on paper and patting one's mirror image when directed to do so gives evidence of readiness to use objects appropriately.

Section C includes five items which are intended to measure development of intentionality or degree of goal-strength. The first item indicates how much the child will seek to overcome a visual restriction, i.e., a towel draped over the head. Willingness to express choices is indicated by reaction to the offer of a drink and the degree of resistance when a treat is taken away. Items 48 and 49 appraise the child's perception of causal relationships and his readiness to use that causal relationship to obtain a desired object, ie.e, to pull on an arm which holds a brightly colored balloon.

The Posture Scale evaluates ability to maintain a secure position in space in both stationary and movement states. Since static and dynamic posture both depend upon the sequential control of body parts from head to trunk to limbs, the items of this scale are presented in the order of their appearance in the normal child. This section evaluates the child's ability to hold himself up against gravity and to move independently. The ability to walk with assistance pre-supposes postural developments which are necessary for walking. Control of trunk and limbs appears in orderly fashion. Head control is gained before the child sits up and crawling is usually seen before standing and walking. Upright

posture and freedom of locomotion are not only necessary for physical independence, but also are basic requirements for the development of body image and the self-concept.

Seven items on the Posture Scale investigate the level of static posture, i e. head-trunk control, sitting and standing. Fifteen items evaluate the development of mobility from rolling through crawling and walking. Three items evaluate readiness to bounce, rock and maintain position in space.

The "how to summarize question" refers to the way in which the individual items are scored and combined in meaningful measures. Because the responses of grossly handicapped children to specific stimuli are variable and often difficult to distinguish from chance, a three point scale was initially constructed. Each item is presented three times by the "evaluator" who is relatively unfamiliar person to the child. The "observer" (the child's therapist or ward attendant) is familiar with the child; he or she must agree with the evalutor as to the number of acceptable responses (as carefully defined by the manual). The common judgment as to the number of times the child performs each item is a step towards objectivity. The items are rate one, two or three according to the number of times the child responds correctly.

In summariaing the results the twenty-five numerical ratings on each of three sections are summed. This sum is designated "a Consistency Score," is placed on the appropriate third of a seventy-five point scale and is given a "Consistency Index" of one, two or three. Later an "Ability Score" was added. This is the sum of the twenty-five items in each section to which the child has responded at least one of three times. This is multiplied by four to give a percentage score. The "Ability Score" reflects the capacity to perform without interference from factors of boredom, fatigue, ill health, lack of rapport, etc.

Discussion

(1) Both the "Consistency Score" and the "Ability Score" present problems as measures of response reliability and indications of ability levels. The "Consistency Score" gives the child more than one chance to respond. This is very important with children of so limited awareness and capacity for movement. In certain cases, we suspect that failure to perform three times is a willful action; the child indicates he knows what we want, but is unwilling to cooperate because of withdrawal tendencies, ill health, lack of rapport or he might be just plain not interested. The "Consistency" ratings do tend to taper off as the child reaches the limits of his capacity to respond. On the other hand, the "Ability Scores" are not as apt to be influenced by the above factors. If this sum includes a majority of "one" ratings which are the sole measure of performance for the items, this score may not reflect ability level. Instead it may reflect "chance" reaction. However, when these two measures are compared with each other, variability factors may be isolated. Usually the "Consistency Scores" will give a unifoim "2" or "3" until the ability level is reached.

(2) The fact that the AMP requires one to one and a half hours sometimes creates a problem. Also the fact that two people are required to administrate an evaluation is sometimes a problem for busy therapists and ward staff. In justification of these procedures, we feel that the multiply handicapped children require careful evaluation by therapists who are specially trainined to present the items in exact accordance with the manual.

(3) A second form of the Glenwood AMP #1 is badly needed. Our children become "AMP knowledgeable" even when the AMP is only repeated once in six months.

(4) The Glenwood AMP has not yet been validated and so, of course, statistical reliability cannot be presented. Plans are now being made to correlate changes in the AMP scores, hopefully brought about by a sensory motor training program for young adults, with changes in scores on the Cattell, Adaptive Scales, and the Balthazar Scale. We are not certain that these correlations will be positive because these measures may be describing adaptive skills while the AMP is measuring pre-adaptive behavior.

Despite the limitations of this relatively new test, which is without statistical validation, the AMP is proving to be helpful in separating children who are alert but who do not have the motor capacity to express that alertness. These children show a high score on the awareness scale and considerably lower scores in the manipulation and posture scales. It also reflects the low awareness and manipulation performance and relatively high postural development of children who are diagnosed as having autistic tendencies. Profiles showing the relationship among the three scales indicate various types of individuals. In this regard, we feel that the Glenwood AMP shows promise in identifying children who have learned to integrate their experience without the benefit of fine and gross motor skills and children who can walk in space but have no capacity to direct their steps to a definite point. Perfect performance on all three scales indicates that the child is functioning on a one and a half year developmental level and shows readiness to learn basic adaptive behavior. The fact that such progress can be made and reflected by the AMP is shown by the fact that approximately half of our trainees in the sensory motor program have been promoted to the second level of training. This progress has been accurately reflected on the Glenwood AMP #1.

I. WHAT PROCESS (Selective Attention and Memory)

A. Awareness

1. Arousal of attention
2. Focus, shift of focus to objects, persons, self
3. Recognition of objects, persons, self

B. Manipulation (Intentional Interaction with Environment)

1. Manual dexterity
2. Imitation
3. Interpersonal relationships
4. Intentionality

C. Posture (Physical and Psychological Security in Space and Independent Movement)

1. Static (secure position)
2. Dynamic (mobility in space)
3. Body Scheme (psychological)
4. Space-time relationship Recognition of stimulus

II. HOW PROCESS (Situations Imposed to Test Recognition)

A. Awareness

1. Extreme stimulation (produces arousal, focus, awareness sensory receptors, (t,a,v,k,o,g)* which in turn produces approach to soothing stimuli and withdrawal to painful stimuli
2. Anticipation of extreme stimuli
3. Recognition of names of familiar people, objects and recognition of own name and mirror image

(This scale tests response without fine motor reactions)

B. Manipulation

1. Spontaneous response to objects, and level of manual dexterity (reach, grasp, hold, transfer, squeeze, finger and thumb opposition)
2. Understanding of object relation shown by imitating use of object
3. Imitating hand movement
4. Expressing needs and desires
5. Choosing between alternatives

(This scale tests intentional fine motor reactions)

C. Posture

1. Static - head, trunk, legs, arm
2. Dynamic development steps in moving in space (rolling, creep, crawl, walk)
3. Balancing ability to move in space

(This scale tests ability to maintain position in space and develop ... ing ... ance)

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